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Remedial Action Plan for Hamilton Harbour



**Goals, Options and
Recommendations**

Volume 1 - Summary

RAP STAGE 2

November 1992

THE
REMEDIAL ACTION PLAN



Goals, Options and Recommendations

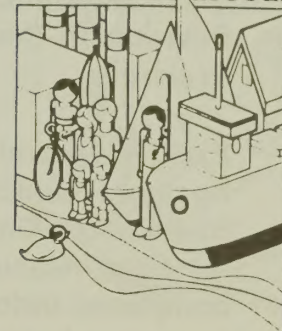
VOLUME 1 - SUMMARY

**A PLAN TO IMPROVE WATER QUALITY AND HABITAT
IN HAMILTON HARBOUR AND COOTES PARADISE, TO
RE-ESTABLISH A HEALTHY AQUATIC ECOSYSTEM,
AND TO IMPROVE THE POTENTIAL FOR MORE
EXTENSIVE RECREATIONAL USES WHILE
MAINTAINING ITS ESSENTIAL ECONOMIC FUNCTION**

*This Plan has been developed by a Technical Team and the
Hamilton Harbour Remedial Action Plan Stakeholders, a public
advisory committee. As such, it is a community-based proposal.
It is not a government report.*

Remedial Action Plan Plan d'Assainissement

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TO: J.S. Ashman, Provincial Co-Chair - COA Review Board
V. Shantora, Federal Co-Chair - COA Review Board

Our File: 5010-20-9

FROM: G. K. Rodgers, Coordinator
Hamilton Harbour
Remedial Action Plan
CCIW - Burlington, Ontario

October 1992

SUBJECT: Transmission of the Hamilton Harbour Remedial Action Plan Stage 2
Report to the Canada-Ontario Agreement Board

On behalf of the Hamilton Harbour Remedial Action Plan Team and the Hamilton Harbour Stakeholders Group, I am pleased to provide you with the Hamilton Harbour Remedial Action Plan Stage 2 Report.

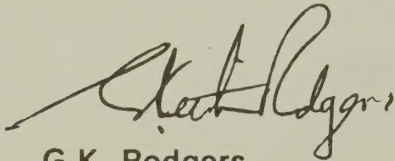
This document presents the principles and goals stipulated by the Stakeholders at the beginning of the planning process and the recommendations which followed from their discussion of many technical and policy aspects of the Plan and the environmental conditions that they wished to see remediated. This report also provides delisting criteria that have been developed with advice from both the Remedial Action Plan Team and the Stakeholders. The report also designates a ranking of technical options and recommends an organizational arrangement to manage the implementation and to provide advice as the Plan develops.

This memorandum is accompanied by a letter from the President of the Bay Area Restoration Council, Mrs. Anne Redish, who is acting on behalf of the Stakeholder executive.

Existing federal and provincial programs, as well as independent initiatives by Regional municipalities, industry and private citizen groups (who are part of the Stakeholder Group) have already taken action on the key and most cost-effective remedial measures. Indeed, about one-half of the rehabilitation had been completed before the RAP planning process was in place. The impact of these measures is already evident in the Harbour. In addition, a great deal of the preliminary engineering and demonstration studies for the more major components of the next stages of the Plan have also been undertaken.

It remains for all levels of government involved to present a statement of commitment to the execution of the overall Plan and the monitoring of conditions that will define the completion of Stage 3 - the full rehabilitation of the Harbour.

This work has been a challenging endeavour. The Team wishes to acknowledge the extensive help that has come from the Stakeholders themselves and from colleagues in all of our agencies who have provided data, advice, investigative work and reports to assist in our endeavours.



G.K. Rodgers,
Coordinator, HHRAP

Hamilton Harbour RAP Team:

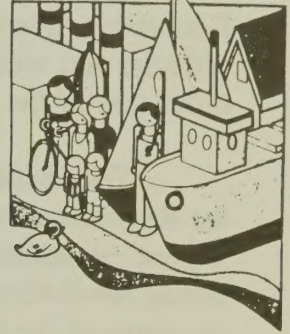
J. Vogt
H. Lang

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T. Murphy

D. Boyde

cc: H. Wong, Director - WCR/OMOE
J. Merritt, Director - CR/OMOE
F. Fleischer, Chairman - RAP Steering Committee



14 September 1992

Messrs. V. Shantora & J. Ashman
Co-Chairmen
Canada-Ontario Agreement Review Board

Dear Messrs. V. Shantora and J. Ashman:

The Hamilton Harbour Stakeholders enthusiastically endorse the Stage 2 Report of the Hamilton Harbour Remedial Action Plan (RAP). We have had the opportunity to review thoroughly the recommendations and to make appropriate changes. We are pleased that the Stage 2 Report reflects our two primary principles;

- that the RAP be developed within the context of an ecosystem approach, and
- that the controls of input of persistent toxic chemicals shall eventuate to zero discharge.

After six years of deliberation we feel that the Stage 2 Report fully addresses our concerns about retaining our Harbour as a multiple-use facility. We envision accommodating not only shipping and navigation, industrial uses and acceptable wastewater effluent; but also recreational boating, water sports, swimming, a reproducing warmwater fishery, a protected wildlife habitat and an educational resource. Strong recommendations directed towards a continued high standard of human health and the promotion of public access and aesthetic improvements to the Harbour will help win public acceptance and support for the total Remedial Action Plan implementation.

The Stage 2 Report has separated the recommendations into six problem areas. We recognize that these problems are so interconnected that in order to achieve success in any one area all others must improve at the same time. Therefore, we forcefully recommend that, while special emphasis must be placed on the high priority solutions, it is essential that action occurs on all fronts simultaneously.

The Stakeholders recommended that during the implementation stage of the Remedial Action Plan they be re-organized into two groups with distinctly different responsibilities. One group, The Bay Area Implementation Team (BAIT), would be responsible for the implementation of the Remedial Action Plan while the other group, the Bay Area Restoration Council (BARC), would be charged with monitoring the progress of the Remedial Action Plan implementation and in keeping the public informed. We are pleased that the Bay Area

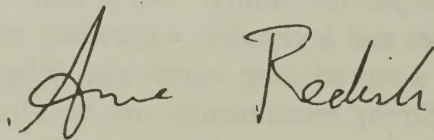
Restoration Council was established in the Fall of 1991. The creation of its counterpart, the essential and vital Bay Area Implementation Team, is imperative for the smooth co-ordination of the implementation of the Remedial Action Plan.

The Hamilton Harbour Stakeholders have worked very diligently in conjunction with the Remedial Action Plan coordinator, and the Remedial Action Plan Writing and Technical Teams. In addition, we have had the benefit of suggestions made by our local citizens during the Public Advisory Campaign. We have recommended that the consultant's summary of the ideas gleaned from the public be included in the appendix to the Stage 2 Report.

We are very pleased that both the Stakeholder constituent groups and the general public are strongly supportive of the Remedial Action Plan, and that in their comments they recommend immediate implementation. It should be noted that many of the Hamilton Harbour Stakeholder constituent groups have worked to assist in the development of the Remedial Action Plan and have already incorporated many of the recommendations into their own planning. Consequently the water quality of the Harbour is already responding well to the actions that have been taken.

In conclusion, the Stakeholders of Hamilton Harbour are fully supportive of the recommendations in Stage 2 of the Remedial Action Plan. We urge our governing bodies to ensure its rapid fulfilment.

Yours truly,

A handwritten signature in cursive script, reading "Anne Redish".

Mrs. Anne Redish
President
Bay Area Restoration Council on behalf of the
Hamilton Harbour Remedial Action Plan Stakeholder Group

PREFACE

Under the Great Lakes Water Quality Agreement (Amended 1987) and the Canada-Ontario Agreement Respecting Great Lakes Water Quality, the Governments of Canada and Ontario are developing Remedial Action Plans to restore impaired uses of the aquatic ecosystem in seventeen of the forty-three Areas of Concern on the Great Lakes. Hamilton Harbour is one of these Areas of Concern.

A team of technical experts from federal and provincial agencies (RAP Team) has been working with the Hamilton Harbour Stakeholders Group, which is made up of individuals representing a broad range of local interests, to develop a draft Remedial Action Plan. This report represents the product of their effort.

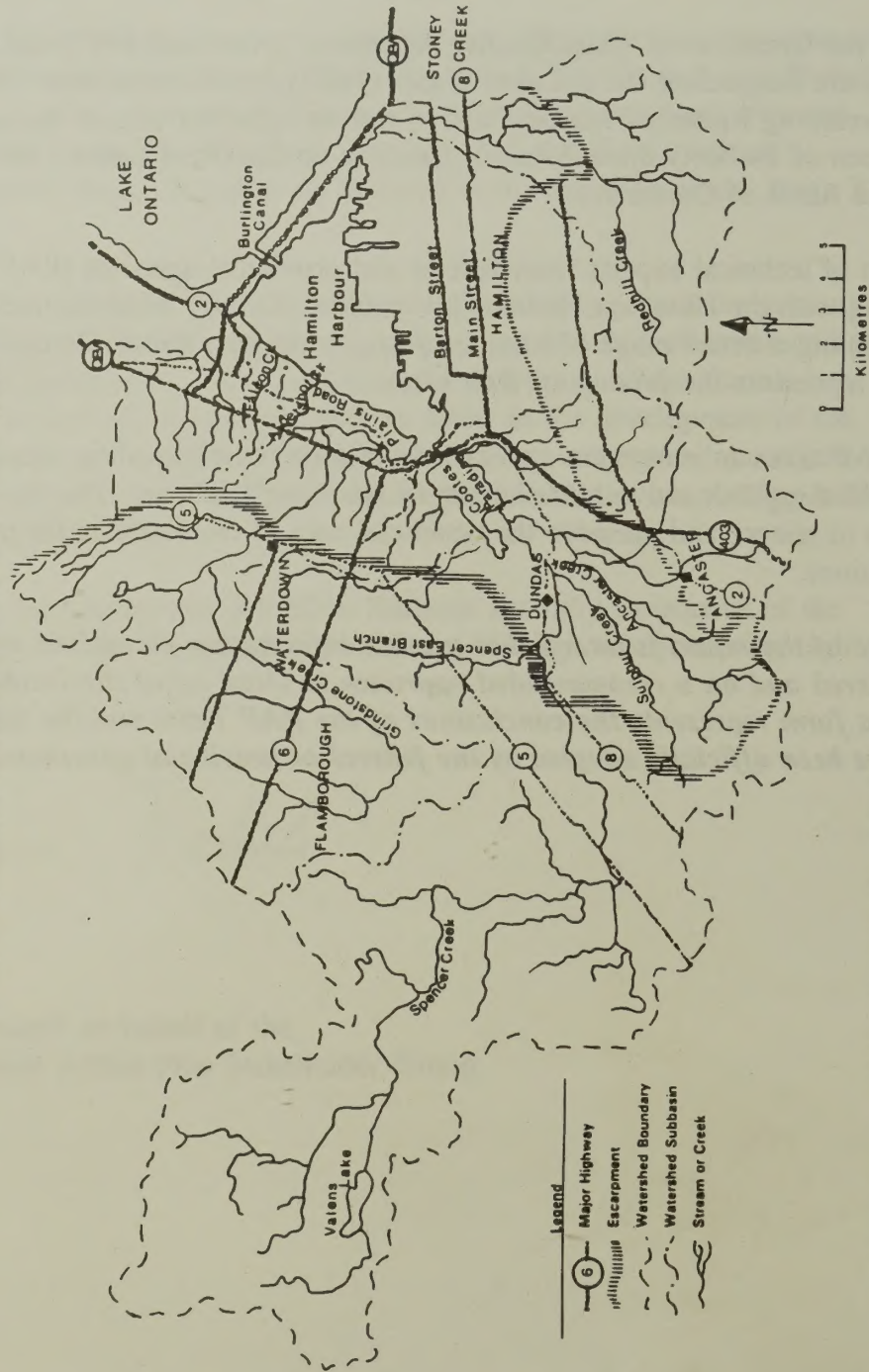
The RAP takes an ecosystem approach to restoring water quality, cleaning up sediments, and re-establishing fish and wildlife habitat in Hamilton Harbour. The ultimate objective of the Plan is to restore and preserve the beneficial uses of the Harbour for present and future generations.

Release of the report is intended to provide information on options which have been considered and on a recommended approach to clean-up of the Harbour. The report in its current form represents the conclusions of the RAP Team and the Stakeholders Group and has not been officially adopted by the federal or provincial governments.

THE WATERSHED

Hamilton Harbour

Three major creeks - Grindstone, Spencer and Redhill feed into Hamilton Harbour from the Watershed



Source: Drawing provided by H. Ng, NWRI.

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SUMMARY

Steps in the Development of the Plan

In a 1985 report, the Ontario Ministry of the Environment (OMOE) summarized water and sediment quality conditions in Hamilton Harbour (Ontario Ministry of the Environment, 1985) and suggested general management options. In 1986 OMOE joined with Environment Canada (EC) in a full consultative process to develop a plan to complete the restoration of the Harbour in accordance with the Great Lakes Water Quality Agreement.

The Stakeholders Group was designed on the community round-table concept with citizen groups, academics, user groups, industry, and government agencies from federal, provincial, and of municipal levels, with local politicians and the Hamilton Harbour Commissioners also taking part. This group developed goals and principles for the Plan in 1986.

Next, the technical team developed the background report (Stage 1 Report of the Hamilton Harbour RAP Writing Team, 1989) required under the conditions of the Agreement on Great Lakes Water Quality, following consultation with Stakeholders. This was endorsed by the International Joint Commission in 1990. While this was being presented, the Stakeholders engaged in developing recommendations and priorities to be included in the Stage 2 Report, following assessment of the various options available.

The train of events is illustrated in Plate 1 and the results of those deliberations are presented here in sequence.

Goals, Objectives, and Principles

The Hamilton Harbour RAP Stakeholders have identified principles they wished to see honoured in the development of the Plan (Hamilton Harbour RAP Writing Team, 1987).

Primary Principles:

1. The Ecosystem Approach

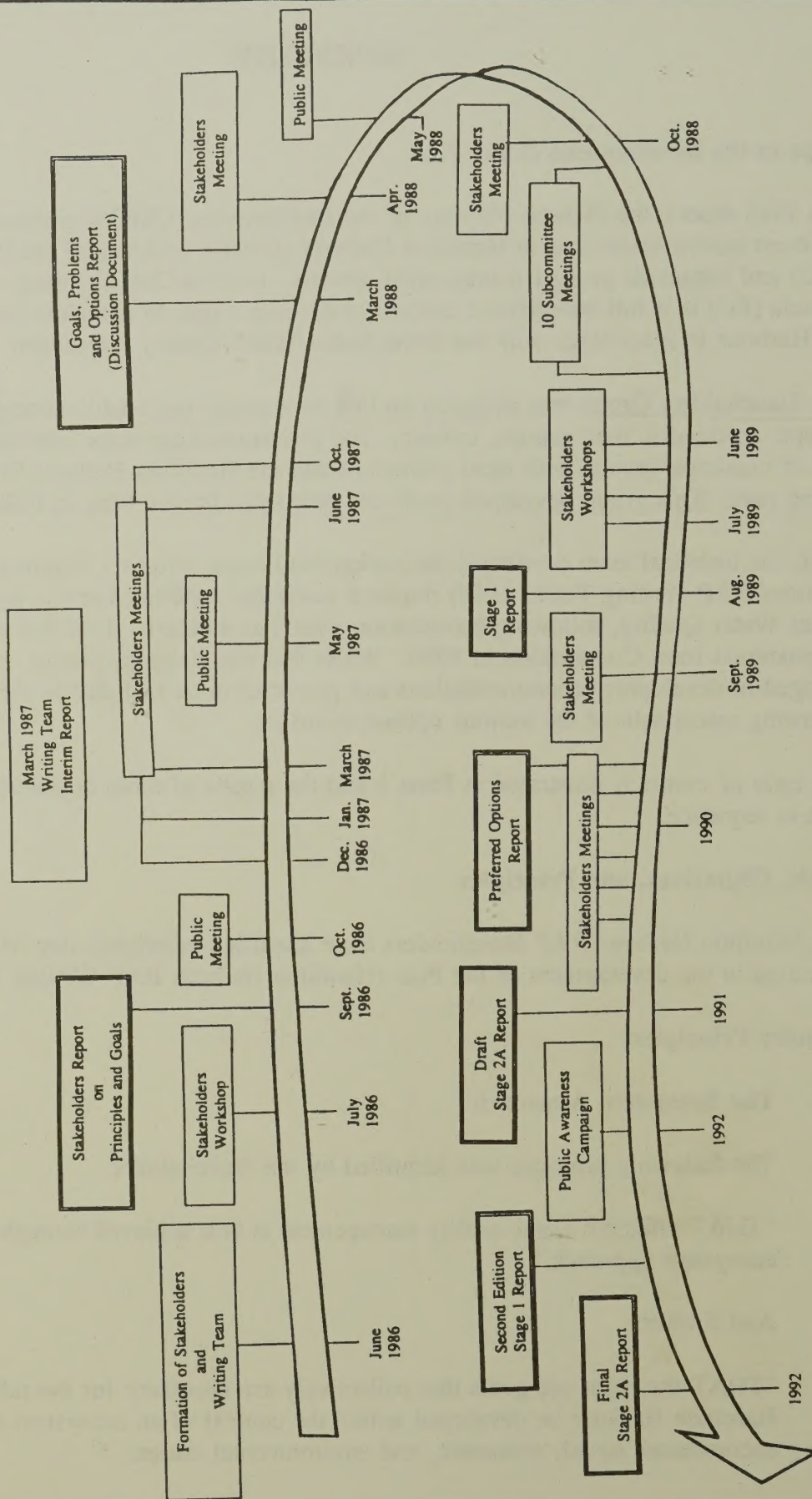
The following principle was identified by the Stakeholders:

"THAT effective water quality management is best achieved through application of an ecosystem approach."

And further:

"THAT the eight use goals that collectively are necessary for the rehabilitation of Hamilton Harbour be developed within the context of an ecosystem approach, that encompasses social, economic, and environmental issues..."

PLATE 1: Hamilton Harbour Remedial Action Planning



And,

"THAT economic, social, and environmental goals must be viewed in an integrated manner, so that not one of the three can or should take precedence over another."

2. Zero Discharge

"The philosophy be adopted whereas control of inputs of persistent toxic substances shall eventuate to zero discharge, and therefore, the discharge of any or all persistent toxic substances be virtually eliminated."

Secondary Principles:

1. Human Health

"THAT the water quality in Hamilton Harbour's drainage basin be improved to ensure a continued high standard of human health and well-being."

And

"THAT through an ecosystem approach, the water quality be improved to support a multiplicity of uses, both in the short and long term."

2. Public Acceptance and Support

The Group agreed that by addressing the peripheral issues of public access to the Harbour and aesthetic enhancement of shoreline and Harbour waters, water quality improvements would result. It was also concluded that public acceptance of water quality improvement, and support for financing necessary to achieve improvement, is crucial to successful RAP implementation.

3. Access

It is the position of the Stakeholders Group that significant improvement is required, in terms both of quantity and quality, in the opportunities for physical and visual access to Hamilton Harbour.

The following principles were agreed upon:

"THAT public access is an important factor in achieving public awareness and support for Hamilton Harbour remedial actions; and

"THAT public support for these actions will result in water quality improvement, leading to community benefits; and

"THAT increased access is a key to achieving remedial actions and should become part of the overall solution, whilst recognizing that access is a local authority concern."

4. Land Use

"THAT the issue of the character and appropriateness of the land uses situated adjacent and in close proximity to the Harbour is of major consequence and must be addressed, if a successful and comprehensive plan for the remediation of Hamilton Harbour is to be achieved."

5. Aesthetics

Shoreline and water aesthetic improvements are important in the public's perception of the Harbour.

The Stakeholders agreed upon the following principle:

"THAT aesthetic improvements, on a Harbour-wide basis, provide the public with a basis for genuine belief that water quality can be improved."

Water Quality Issues

1. Impact on Lake Ontario

Goal: "To remove the potential negative impact of Hamilton Harbour's water quality on the nearshore waters of Lake Ontario, with particular attention to areas of nearshore public uses and drinking water intake pipes for the Cities of Hamilton and Burlington."

Therefore, it was agreed that in order to achieve this general goal, the following recommendations be adopted:

"THAT current actions and uses in the Harbour be carefully considered as to their impact on Lake Ontario; and

"THAT remedial actions to enhance Harbour water quality commence immediately, and be implemented on a continuous basis; and

"THAT the proposal to re-direct sewage treatment plant effluent to Lake Ontario be rejected due to its impact on Lake Ontario, and it being, at best, a short term, "band-aid" solution to Harbour water quality; and

"THAT municipal, industrial, and non-point loadings to the Harbour and the Lake be managed through the identification and application of loading targets that are necessary to meet water quality criteria and reduce these loadings."

2. Windermere Basin

"THAT the Windermere Basin study (1986) and recommended remedial actions be considered separately from and proceed in advance of the overall Harbour RAP, providing that the Ontario and Federal Environment Ministers ensure full public consultation and hearing on the alternatives."

Restricted Use

1. Shoreline Filling

"THAT any filling for environmental or access enhancement purposes should:

- meet the objectives established in the RAP;
- contain fill of an acceptable quality to meet provincial guidelines;
- be subject to environmental assessment."

2. Wastewater Receiving Body

In order to achieve desired uses, its current use as a wastewater receiving body in the total Harbour should be restricted to certain areas or zones of the Harbour. For example, sewage treatment plant outfalls would not be acceptable in a proposed swimming area; where habitat may be damaged; or where body contact sports are proposed.

Water Use Goals

1. Recreational Boating

"THAT immediate action should be taken to improve water quality for recreational boating, on a continuing basis, for the total Harbour."

2. Water Sports

"THAT, on an area specific basis, water quality should be improved to permit increased use of the Harbour for water sports on a continuing basis."

3. Shipping and Navigation

"THAT shipping, navigation and related uses should continue and be operated in a manner consistent with sound environmental principles and practice."

4. Industrial Uses

"Improve water quality to levels appropriate to supporting industrial operations that draw water from the Harbour."

"THAT industrial water uses should continue in certain areas of the Harbour, and that effluent discharges should meet Ministry of the Environment guidelines (MISA)."

5. Wastewater Receiving Body

"THAT the whole Harbour's current status as a wastewater receiving body be changed, so that it becomes a recipient of acceptable effluent only in specific areas; and

"THAT a loadings target approach be established for point and non-point pollutant sources, and linked to all other uses to ensure effluent quality does not impede other uses."

6. Fisheries

"THAT water quality and fish habitat should be improved to permit an edible, naturally reproducing fishery for warmwater species. Water and habitat conditions in Hamilton Harbour should not limit natural reproduction and the edibility of coldwater species."

7. Wildlife Appreciation and Habitat Protection

"THAT healthy self-sustaining resident and non-resident wildlife populations should be enhanced on a Harbour-wide basis through water quality improvements and habitat rehabilitation and protection."

8. Swimming

"THAT providing that water quality meets appropriate health standards in the west end to support swimming as a use, water quality be enhanced to permit swimming, in the short term; and

"THAT in the event of faecal coliform counts exceeding water quality objectives for human contact, consideration should be given to using disinfectants and suitable membrane barriers to permit swimming, in the short term; and

"THAT Hamilton Harbour water quality should be improved so that it (a) provides for swimming in certain areas of the Harbour over the long term; and (b) has no impact on water quality for swimming in nearshore Lake Ontario."

9. Educational Resources

"THAT educators be represented as a Stakeholders Group; and

"THAT MOE and DOE should work separately with formal and informal education groups to promote the Harbour as an educational resource; and

"THAT educational programs be developed to change public perception of the current condition of the Harbour in support of efforts made by Stakeholders, towards remedial actions."

Relation to Great Lakes Water Quality Agreement Beneficial Uses

The fourteen beneficial uses listed in Annex 2 of the GLWQA (1978/87) are all encompassed in the goals and principles of the Hamilton Harbour RAP.

Translation of These Goals into Measures to be Achieved

The attainment of these goals requires the achievement of specific water quality and sediment quality objectives. The amounts and types of fish and wildlife habitat have also been specified, as are desirable population mixes indicative of a restored aquatic ecosystem.

Finally, limits for discharge of various contaminants giving rise to the problems standing in the way of achieving these goals are also specified.

Problems to be Addressed

1. Contamination of bottom sediments causing fish contamination and fish health problems, wildlife problems, loss of viable benthic populations as units of the food chain, causing costly removal, confined disposal or treatment of navigation dredgeate, and being the source of remobilized historic contaminant deposits.
2. Contaminants in the water column above the water quality standards resulting in water potentially toxic to fish and wildlife and potentially unsuitable as a source of drinking water.
3. Eutrophication, with attendant algae growth, reduced water quality and low dissolved oxygen in Harbour waters which affect fish habitat, water and shoreline aesthetics, odours, and remobilization of some contaminants.
4. Poor water clarity, a particular aspect of eutrophication, plus suspended sediment (partly eroded material) being introduced into the Harbour. This affects weed habitat, swimming conditions, and general water aesthetic conditions.
5. Bacterial contamination that precludes the opening of beaches in the Harbour and presents a risk to water sport participants.
6. A warmwater fishery population that is heavily stressed, unbalanced towards pollution-tolerant species, experiencing health problems (tumours, skin lesions) and subject to restrictions on their human consumption due to contaminant content of the fish fillets.
7. Wildlife and bird populations have experienced a variety of positive and negative elements causing loss of duck populations (lack of marsh habitat), gain of colonial

waterbirds (in gulls, probably to extreme population levels), and experiencing health and reproduction problems in the recent past.

Delisting Guidelines

The beneficial uses selected for Hamilton Harbour call for achievement of a set of environmental conditions that are deemed necessary to ensure that these uses are not impaired. The following table (Table A) makes those conditions explicit in terms of both general objectives and the specifics of what are deemed necessary to achieve the maintenance or restoration of the beneficial uses.

As well as can be established with our existing knowledge, these conditions or objectives are the measurable targets against which we can gauge our progress towards completion and maintenance of a restored Harbour.

Table A:

Objectives to be achieved in order to permit delisting of Hamilton Harbour, in terms of: water quality; contaminants in fish and wildlife; sediment quality; loading targets for contaminants affecting the beneficial uses; the extent of habitat for fish and wildlife; and the population size and structure for fish and wildlife.

USE IMPAIRMENT		PROPOSED HAMILTON HARBOUR DELISTING OBJECTIVES												
(i)	Restriction on fish and wildlife consumption.	That there be no restrictions on consumption of fish and wildlife from the Harbour attributable to local sources.												
(ii)	Tainting of fish and wildlife flavour.	When survey results confirm no tainting of fish or wildlife flavour.												
(iii)	Degraded fish and wildlife populations.	That the <u>fish community</u> has the following structure: 1. Shift from a fish community indicative of eutrophic environments, such as white perch, alewife, bullheads, and carp to a self sustaining community more representative of a mesotrophic environment, containing pike, bass, yellow perch, and sunfish. 2. Attain a littoral fish biomass of 200 - 250 kg/ha. 3. Increase the species richness from 4 species to 6-7 species per transect. 4. Increase the native species biomass from 37% to 80-90% of the total biomass. 5. Reduce the spatial variability in fish biomass within the Harbour. 6. Proposed nearshore fish community of Hamilton Harbour: <table><tr><th>Category</th><th colspan="2">Littoral Biomass (kg/ha)</th></tr><tr><td>Piscivores Specialists</td><td>(pike, bass)</td><td>40 - 60</td></tr><tr><td rowspan="2">Generalists</td><td>(Insectivores like pumpkinseeds and yellow perch)</td><td>70 - 100</td></tr><tr><td>(omnivores like carp and brown bullheads)</td><td>30 - 90</td></tr></table> The percent of fisheries biomass allocated to the three trophic groups was based on the effects of improved water quality in the Bay of Quinte and Severn Sound. The littoral fish biomass of 200-250 kg/ha was based on electrofishing data collected from Hamilton Harbour, Bay of Quinte and Severn Sound in 1990.		Category	Littoral Biomass (kg/ha)		Piscivores Specialists	(pike, bass)	40 - 60	Generalists	(Insectivores like pumpkinseeds and yellow perch)	70 - 100	(omnivores like carp and brown bullheads)	30 - 90
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Table A - continued next page

USE IMPAIRMENT	PROPOSED HAMILTON HARBOUR DELISTING OBJECTIVES														
	5. <u>Colonial waterbirds:</u> The overall objective is to have a self sustaining mixed community of colonial waterbirds generally with an increase of the rarer species and a reduction in the number of ring-billed gulls which currently nest in the Harbour. These figures are subject to revision once these general levels have been reached. Management of colonial waterbirds is experimental and achieving specific populations of particular species is highly speculative. <table> <thead> <tr> <th>Colonial waterbirds: (Suggested Interim Targets)</th><th>Number of Pairs</th></tr> </thead> <tbody> <tr> <td>Ring-billed gulls (<u>Larus delawarensis</u>)</td><td>5,000</td></tr> <tr> <td>Common terns (<u>Sterna hirundo</u>)</td><td>> 600</td></tr> <tr> <td>Herring gulls (<u>Larus argentatus</u>)</td><td>350</td></tr> <tr> <td>Caspian terns (<u>Sterna caspi</u>)</td><td>> 200</td></tr> <tr> <td>Double-crested cormorants (<u>Phalacrocorax auritus</u>)</td><td>200</td></tr> <tr> <td>Black-crowned night herons (<u>Nycticorax nycticorax</u>)</td><td>200</td></tr> </tbody> </table> 6. <u>Other wildlife including waterfowl:</u> No target will be suggested for other species of birds or animals, but a target for habitat has been suggested which will enhance wildlife populations generally. In addition, management of some species may be necessary as a result of habitat enhancement. 7. Fish and wildlife bioassays confirm no significant toxicity from water column or sediment contaminants.	Colonial waterbirds: (Suggested Interim Targets)	Number of Pairs	Ring-billed gulls (<u>Larus delawarensis</u>)	5,000	Common terns (<u>Sterna hirundo</u>)	> 600	Herring gulls (<u>Larus argentatus</u>)	350	Caspian terns (<u>Sterna caspi</u>)	> 200	Double-crested cormorants (<u>Phalacrocorax auritus</u>)	200	Black-crowned night herons (<u>Nycticorax nycticorax</u>)	200
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Black-crowned night herons (<u>Nycticorax nycticorax</u>)	200														
(iv)	Fish tumours or other deformities. When incidence rates of fish tumours or other deformities do not exceed rates at unimpacted control sites that are locally relevant and when survey data confirm the absence of neoplastic or preneoplastic liver tumours in bullheads or suckers.														

USE IMPAIRMENT		PROPOSED HAMILTON HARBOUR DELISTING OBJECTIVES																																																																																																																																					
(viii)	Eutrophication or undesirable algae.	That there are no persistent adverse water quality conditions for each of the components attributable to cultural eutrophication. The following net loading targets provide the specific objectives. Eutrophication goals and anticipated conditions in Hamilton Harbour, Cootes Paradise, and the Grindstone Creek area: TABLE (a): Net Loading Targets (Kg/d) <table><tr><th rowspan="2"></th><th colspan="2">Phosphorous</th><th colspan="2">Ammonia</th><th colspan="2">Suspended Solids</th></tr><tr><th>Initial</th><th>Final</th><th>Initial</th><th>Final</th><th>Initial</th><th>Final</th></tr><tr><td>Hamilton STP</td><td>140</td><td>60</td><td>2270</td><td>530</td><td>3750</td><td>900</td></tr><tr><td>Burlington STP</td><td>30</td><td>12</td><td>470</td><td>115</td><td>500</td><td>200</td></tr><tr><td>CSOs</td><td>70</td><td>5</td><td>180</td><td>20</td><td>1400</td><td>200</td></tr><tr><td>Streams(*)</td><td>90</td><td>65</td><td></td><td></td><td>30000</td><td>20000</td></tr><tr><td>Industry (gen'l)</td><td></td><td></td><td>400</td><td>270</td><td></td><td></td></tr><tr><td>Stelco</td><td></td><td></td><td></td><td></td><td>4000</td><td>1500</td></tr><tr><td>Dofasco</td><td></td><td></td><td></td><td></td><td>3500</td><td>1500</td></tr></table> TABLE (b): Environmental Conditions <table><tr><th rowspan="2"></th><th colspan="2">Hamilton Harbour</th><th colspan="2">Cootes Paradise</th><th colspan="2">Grindstone Creek Area</th></tr><tr><th>Initial</th><th>Final</th><th>Initial</th><th>Final</th><th>Initial</th><th>Final</th></tr><tr><td>P conc (ug/l)</td><td>34</td><td>17</td><td></td><td></td><td>60-70</td><td>60-70</td></tr><tr><td>Un-ionized NH₃ conc (mg/l)</td><td><0.02</td><td><0.02</td><td></td><td></td><td></td><td></td></tr><tr><td>Chlorophyll a conc (ug/l)</td><td>15-20</td><td>5-10</td><td></td><td></td><td>20</td><td>20</td></tr><tr><td>Secchi Disc Trans (m)</td><td>2.0</td><td>3.0</td><td></td><td></td><td>1.0</td><td>1.0</td></tr><tr><td>Min. DO conc (ppm)</td><td>1-4</td><td>>4</td><td></td><td></td><td></td><td></td></tr><tr><td>Aquatic Plant Area ha</td><td>105</td><td>170</td><td></td><td></td><td>240</td><td>50</td></tr><tr><td>Seston conc (mg/l)</td><td></td><td></td><td></td><td></td><td>10</td><td>10</td></tr></table> * Stream loadings are extremely variable from year-to-year. The percentage of reduction is based on the estimated effect of best management practice.											Phosphorous		Ammonia		Suspended Solids		Initial	Final	Initial	Final	Initial	Final	Hamilton STP	140	60	2270	530	3750	900	Burlington STP	30	12	470	115	500	200	CSOs	70	5	180	20	1400	200	Streams(*)	90	65			30000	20000	Industry (gen'l)			400	270			Stelco					4000	1500	Dofasco					3500	1500		Hamilton Harbour		Cootes Paradise		Grindstone Creek Area		Initial	Final	Initial	Final	Initial	Final	P conc (ug/l)	34	17			60-70	60-70	Un-ionized NH ₃ conc (mg/l)	<0.02	<0.02					Chlorophyll a conc (ug/l)	15-20	5-10			20	20	Secchi Disc Trans (m)	2.0	3.0			1.0	1.0	Min. DO conc (ppm)	1-4	>4					Aquatic Plant Area ha	105	170			240	50	Seston conc (mg/l)					10	10
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USE IMPAIRMENT		PROPOSED HAMILTON HARBOUR DELISTING OBJECTIVES
(v)	Bird or animal deformities or reproductive problems.	When the incidence rates of deformities or reproductive problems in sentinel wildlife species do not exceed background levels in control populations.
(vi)	Degradation of benthos.	1. Biomass estimates for mesotrophic conditions to range from 25 to 50 g/m² wet weight of benthos. 2. Shift in oligochaete assemblages (benthic sludge worms) from <u>Limnodrilus hoffmeisteri</u>, <u>Tubifex tubifex</u>, indicators of eutrophic environments, to mesotrophic indicators such as <u>Spirosperma ferox</u>, <u>Stylodrilus heringianus</u>, and <u>Llyodrilus templetoni</u>. 3. An increase in the contribution of other species in Hamilton Harbour sediment indicative of mesotrophic conditions such as midges (<u>Tanytus</u> and <u>Strictochironomus</u>), fingernail clams (<u>Pisidium</u>), mayflies (<u>Haxagenia</u>) and the amphipod (<u>Pontoporeia hoyi</u>). 4. Reduction in oligochaete (sludge worm) density from an average 10,000 animals per m² found in 1984 to between 2,000 and 3,000 per m² in profundal sediments. 5. Appearance of crustaceans, such as freshwater shrimp, (<u>Mysis relicta</u>) in the deep water basin and the amphipod (<u>Pontoporeia hoyi</u>) in the surficial sediments throughout the hypolimnion. 6. Absence of acute and chronic toxic effects attributable to trace metals or organics in benthic macroinvertebrates throughout the Harbour and Cootes Paradise (Station 270 at the west end of the Harbour has been selected as an interim, local target). See also Dredging delisting criteria (vii).
(vii)	Restrictions on dredging activities.	When contaminants in sediments do not exceed biological and chemical standards, criteria, or guidelines such that there are restrictions on dredging or disposal activities.

Table A - continued next page

USE IMPAIRMENT		PROPOSED HAMILTON HARBOUR DELISTING OBJECTIVES				
(ix)	Restrictions on drinking water consumption or taste and odour problems.	Maintenance of water quality conditions in the Harbour pertinent to standards for human health where a water supply would only require standard treatment procedures (settling, coagulation, disinfection).				
(x)	Beach closings. (Water contact sports.)	1. That Hamilton Harbour effluent to Lake Ontario not give rise to conditions which would cause restrictions on open Lake water contact sports. 2. That water quality conditions in the west-end and in the north-half of the Harbour, be such as to permit opening of beaches and which would cause no significant restriction on water contact sports.				
(xi)	Degradation of aesthetics.	When the waters are free of any substance which produces a persistent objectionable deposit, unnatural colour or turbidity, or unnatural odour (e.g. oil slick, surface scum).				
(xii)	Added cost to agriculture or industry.	When there are no significant additional costs required to treat water prior to use for agricultural purposes (i.e. including, but not limited to livestock watering, irrigation and crop-spraying) and industrial purposes (i.e. intended for commercial or industrial applications and non-contact food processing). Cost associated with zebra mussels or other invasive organisms are excepted.				
(xiii)	Degradation of phytoplankton and zooplankton populations.	When phytoplankton and zooplankton community structure does not significantly diverge from unimpacted control sites of comparable physical and chemical characteristics. Further in the absence of community structure data, this use will be considered restored when phytoplankton and zooplankton bioassays confirm no significant toxicity in ambient waters.				
(xiv)	Loss of fish and wildlife habitat.	1. Increase quantity of emergent and submergent aquatic plants in Hamilton Harbour, Cootes Paradise, Grindstone Creek delta, and Grindstone Creek marshes to approximately 500 hectares in accordance with the Fish and Wildlife Habitat Restoration Project. 2. Provide an additional 10 km of littoral shore by creating 5 km of narrow islands. 3. Create an additional 344 ha of lagoon habitat for waterfowl. 4. Create 270 ha of colonial nesting habitat. 5. Water clarity targets for the summer season (June to September) as measured by Secchi Disc: <table><tr><td>Harbour</td><td>3.0 m</td></tr><tr><td>Cootes Paradise & Grindstone Creek</td><td>1.0 m</td></tr></table>	Harbour	3.0 m	Cootes Paradise & Grindstone Creek	1.0 m
Harbour	3.0 m					
Cootes Paradise & Grindstone Creek	1.0 m					

Table A - continued next page

Order of Importance of the Technical Remedial Options in the Plan

Following analysis of the **technical** options available to achieve the goals outlined, and their review by both the Ecosystem and Technical Options committees of the Stakeholders and a full Stakeholders Workshop, the following priorities emerged:

1. Correction of combined sewer overflows, with first priority to discharges in Cootes Paradise and the western half of the Harbour.
2. Improved efficacy of the sewage treatment plant operations through:
 - a) process audits,
 - b) improved chemical treatment,
 - c) improved aeration and hydraulics and any necessary clarifier or recycle line capacity modifications,
 - d) computer-aided automated operational control systems installed.
3. Installation of filters as an additional step in sewage treatment at the Burlington and Hamilton-Wentworth Sewage Treatment Plants (after #2, and only if required).
4. Erosion control in the rural and urban areas, with emphasis on processes affecting channel erosion below the escarpment, on erosion from construction sites (housing developments, highways, railroad, and industrial), and potential nutrient discharges from farming operations.
5. Greater control on spills that can impact on the Harbour directly (such as a cargo spill or a direct industrial spill) or indirectly, such as spills into the sewer system that disrupt the operation of a sewage treatment plant.
6. Measures to address habitat restoration for fish and wildlife and to address needs for changes in the species composition of the fish population.
7. Control of bacterial contamination sources affecting the north shore of the Harbour.
8. Further controls on industrial discharges (details as yet incomplete but emphasizing in-plant recycling and source reductions).
9. Addressing the problems associated with bottom sediments contaminated by a variety of toxics from past and current discharges to the Harbour.
10. Mitigation of low hypolimnetic oxygen conditions (summer only) until causes of the dissolved oxygen depletion have been remediated as a short experiment.

Concerns about reducing pollution at source, and the consequences of population growth in the watershed and around the west end of Lake Ontario have been considered. There are also difficulties encountered in achieving an integrated, coordinated plan given the multiplicity of agencies. There are some overlapping responsibilities on the one hand while on the other hand, some aspects are not covered by existing mandates.

These, as well as concerns for the planning process and the provision of information for the developing environmental awareness amongst our fellow citizens, are expressed in the recommendations outlined in Table B which call for action in a variety of jurisdictions.

Recommendations

Following full discussion, the Stakeholders have adopted the following recommendations:

Recommendation #1

- (a) It is recommended that the key goal for the Harbour be,

That dissolved oxygen levels will be maintained above 4 mg/L throughout the Harbour, to increase the fish habitat, improve benthic fauna diversity and amount, and to reduce the toxicity of bottom sediments.

- (b) Since goal #1 embodies remedial measures that will impact on water clarity, bacterial contamination, unacceptable levels of ammonia, nuisance algae growth, trace contaminants and unsightly, putrescent or objectionable sludge deposits, it is recommended:

That these factors be addressed concurrently with the measures relating to the goal for restoration of dissolved oxygen in the Harbour.

- (c) Based on these considerations, it is therefore recommended that measures be taken to remediate in the following order of priority:

- i) The combined sewer overflows into Cootes Paradise and the western half of the Harbour,
- ii) The remaining combined sewer overflows in the eastern half of the Harbour, on the condition that no increase in total phosphorus or ammonia loadings will result elsewhere in the Harbour,
- iii) The discharges of ammonia, phosphorus, and suspended solids in all sewage treatment plants in the Harbour to meet the loading capacities specified in Table A, and
- iv) Specifically to deal with nutrient enrichment problems in confined areas of the Harbour, that the phosphorus concentration in the effluent be reduced to less than 0.1 ppm at the Dundas and Waterdown sewage treatment plants.

- (d) In order to properly gauge the impact of current and proposed remedial measures, it is recommended that the conditions (dissolved oxygen, clarity, and algae) be monitored very carefully in the Harbour and Cootes Paradise, and that confidence in our ability to predict changes be improved by analysis of these data and by development of more comprehensive calibrated models.

Recommendation #2

That ambient water quality criteria and sewage treatment plant effluent criteria for Cootes Paradise and Grindstone Creek be reviewed to ensure that loadings from the sewage treatment plants have no further significant impact on the ecological value of these two areas.

Recommendation #3

That municipalities and other authorities develop a shoreline management strategy whereby they acquire and develop land for public use, use existing lands under their control, and identify new sites as they become available, in order to provide substantially more physical access to the shores of the Harbour. Specifically the goal shall be 25 percent of the bay shoreline (including the contribution from the Habitat Project), and that goal to be achieved by 1996.

Recommendation #4

That erosion be minimized through utilizing such measures as conservation tillage, buffer strips, cover crops, crop rotation and structural controls as appropriate.

Recommendation #5

That erosion be minimized during subdivision construction by utilizing best management practices. These management practices must be developed, adopted, and enforced by municipalities and conservation authorities, and that training programs for inspectors and construction site supervisors be established by provincial authorities.

Recommendation #6

That other sources of erosion and contaminants be located by carrying out further studies on tributary streams, and remedial measures suggested.

Recommendation #7

That spills and near-spills into the Harbour and/or on surrounding areas are reported publicly, and their severity, frequency, and potential for further reduction be monitored. The process of spill handling should be reviewed every two years.

Recommendation #8

To reduce stress on fish due to trace contaminants, lack of oxygen in the bottom waters, and lack of submerged weed habitat, it is recommended:

That light penetration be increased in Harbour waters, and that oxygen demand in the hypolimnion and possible exposure of fish to toxic substances be reduced by improving the water quality and sediment quality in the Harbour as recommended in other sections of this report.

Recommendation #9

As recommended in Section IV, that efforts be undertaken to restore 240 ha of submerged and emergent vegetation in Cootes Paradise, by controlling carp populations and introducing natural predators, or by other measures (subject to environmental assessment).

Recommendation #10

That emergent marsh vegetation in Grindstone Creek, including the pike spawning marsh be restored and that measures be adopted to exclude carp such as a carp barrier containing a fishway that will permit the passage of other fish species during their upstream and downstream migrations in Grindstone Creek.

Recommendation #11

That in order to mitigate the destructive effects of the existing large numbers of large carp on wildlife and fish habitat, carp control in Hamilton Harbour and Cootes Paradise be implemented. Studies are necessary to determine the effectiveness of methods of carp control, but preference is to be given wherever possible to techniques designed to exclude their access rather than by removal. Methods to exclude carp must not prohibit the movement of other fish species between Cootes Paradise and Hamilton Harbour.

Recommendation #12

That island structures be created at several locations offshore for various purposes such as the creation of lagoon habitats for fish and waterfowl, the provision of nesting and loafing habitats for colonial birds, increasing the amount of "sloping edge", the prevention of erosion of the shore and resuspension of bottom sediments, and where possible facilitate access, provide linkages to other green spaces along the Harbour, and improve aesthetics.

Recommendation #13

Encourage coordination among Lake Ontario, Harbour and Cootes Paradise shorelines projects such as the proposed habitat creation projects and the development of Pier 4 Park, the waterfront park on the former Lax property, and the waterfront park on Burlington's beach front.

Recommendation #14

That top predators be introduced to the Harbour to restructure the fish community.

Recommendation #15

That the status of the fish community and habitat improvements be monitored.

Recommendation #16

That regulatory agencies apply Canada's Fish Habitat Policy to ensure the regulation of "no net loss" of all fish habitats in Hamilton Harbour, and now that the Fish and Wildlife Habitat Restoration Plan has been developed, to ensure that developers, landowners, Conservation Authorities and other regulatory agencies comply with the development application guidelines for areas sensitive to development.

Recommendation #17

That one or more indicator species, solely indicative of the conditions within the Harbour, be established to monitor wildlife populations and contaminant levels in wildlife in the Harbour. A battery of appropriate biological responses should be developed and monitored.

Recommendation #18

That contaminant levels in the water, sediment, and foodchain be reduced as much as possible to allow for the presence and natural reproduction of the most sensitive native species of aquatic and terrestrial life, and to prevent any contaminant-related restrictions on fish consumption.

Recommendation #19

That indicators of wildlife health and efficacy of remediation efforts to control contaminants be determined by developing contaminant concentration objectives for indicator wildlife species.

Recommendation #20

That steps be taken to minimize contaminant uptake by wildlife in Confined Disposal Facilities.

Recommendation #21

That research be encouraged on the biological significance of environmental contaminants in Hamilton Harbour.

Recommendation #22

That BARC maintain a Fish and Wildlife committee which endorses the concept and principles of the 1990 Fish and Wildlife Restoration Project subject to detailed workplan development; development of partnerships as required for the DOE Cleanup Fund; ensuring BARC involvement and representation on the Steering Committee for the project; and augmentation of the EARP process through involvement of BARC in the planning and implementation of the project.

Recommendation #23

That habitat be maintained or created as necessary in the Harbour, or in Lake Ontario immediately adjacent to the Harbour, to support nesting populations of colonial waterbirds at selected areas, and that all development projects be reviewed by the Fish and Wildlife committee to ensure they comply with Canada's Fish Habitat Policy.

Recommendation #24

That marsh boardwalks and wildlife viewing platforms be created on Cootes Paradise marsh and in certain strategic Harbour locations, provide access, and opportunities for wetland appreciation and education of the surrounding area.

Recommendation #25

If urban storm runoff is determined to be a significant source of bacterial contamination to the Harbour, that the source of this bacteria be established in order to eliminate the transfer of bacteria to the Harbour.

Recommendation #26

That, while continuing to disinfect sewage effluent, alternatives to chlorination be considered to reduce the risk of producing unwanted chlorinated organics.

Recommendation #27

That the improvement in bacteria quality be monitored and the existence of no new sources of bacteria be verified (e.g. north shore streams) by immediately conducting regular sampling for bacteria in candidate swimming areas of the Harbour.

Recommendation #28

To meet the goal of zero discharge or virtual elimination of trace metals and trace organics within as short a time as possible, it is recommended:

That remedial measures be implemented for industries discharging trace contaminants to the Harbour, to the watershed or to the municipal sewer systems under both the criteria for 'Best

Available Technology that is Economically Achievable' (BATEA), and the criteria deemed necessary to ensure good water and sediment quality in the Harbour and its tributaries and reduction of contaminants in fish and biota to the maximum extent possible.

Recommendation #29

Standards and procedures have not been fully established for assessing the need or desirability of remediating contaminated sediments. For this situation, certain preparatory work is urgently needed, namely:

- a) For the more severely contaminated areas of sediment, that biologically-based clean-up criteria be established; that three-dimensional chemical and bioassay mapping be carried out; that biological assessment of current suspended sediment loading be carried out (to ensure that potential new sediments would meet the standards); and that effluent sources for biologically available forms of trace organics be assessed.
- b) For the general wide-spread sediment contamination in the Harbour, that a biological assessment of existing sediment following prolonged oxygenation be urgently carried out; that an assessment of contaminant transfer from the sediment to benthos and bottom-feeding fish be carried out; that cause-effect toxicity be carried out to allow development of more chemical-specific effluent limits; and that a model integrating all the information be developed to better relate contaminant sources and their effect, and to better predict the "recovery" period for the large mass of historically contaminated sediment in the Harbour.

Recommendation #30

That household hazardous waste collection services be continued and expanded by Regional Municipalities, and that citizens be further encouraged to use collection depots for the disposal of toxic chemicals.

Recommendation #31

That pesticide use (herbicides, insecticides, etc.) by all agencies and organizations responsible for parks, conservation areas, or other larger tracts of land within the watershed be reviewed with the intent to substantially reduce the loading to the Harbour and its watershed.

Recommendation #32

That artificial oxygenation or aeration of the hypolimnion be considered as an interim measure:

- to achieve the desired hypolimnetic dissolved oxygen concentration immediately while other options are being implemented; and,

- to confirm that a diverse benthic invertebrate population can develop in the sediments of the Harbour without any toxicity, growth limitation or bioaccumulation problems.

Recommendation #33

To inform the public and students of the present conditions in the Harbour and to encourage them to support the efforts being made to clean up the Harbour.

That the Stakeholders Group/BARC appoint a Task Force with the responsibility of forming a public information/education committee and an education liaison committee to develop and maintain public information and education programs and to open and staff an environmental information centre.

Recommendation #34

To highlight the Areas of Concern in the Great Lakes and Hamilton Harbour in particular, that existing and proposed centres, such as the Royal Botanical Gardens, Hamilton and Halton Region Conservation Authorities, Burlington and Hamilton City Halls, and the proposed Great Lakes Science Centre be used as distribution points to disseminate information regarding Hamilton Harbour and the RAP, and to generally encourage a more informed ecosystem perspective in people's day-to-day lives.

Recommendation #35

That all owners, agencies, and governments having jurisdiction to plan and/or implement plans within the watershed, incorporate, in a co-operative and co-ordinated manner - within their respective plans, policies, programs, and regulations - the relevant principles, goals and objectives for the Harbour, abutting properties and the watershed area set out in this Hamilton Harbour Remedial Action Plan, in addition to specific recommendations which may be set out elsewhere in the plan. Without detracting from the generality of the foregoing, the following matters specifically should be addressed:

- meet the loading targets and water quality standards for the Harbour;
- shoreline management encouraging natural vegetative cover;
- habitat management for fish and wildlife within and adjacent to the Harbour;
- physical access to the Harbour by wildlife and people;
- visual access to the Harbour from the surrounding land area; and,
- visual, aesthetic and experiential quality of the Harbour and environs.

And further, that as a long-term objective and outcome to this process, to establish a single planning document which consolidates the accomplishments of the stated objectives for the Harbour and its watershed.

Recommendation #36

That the two Conservation Authorities collaborate on the preparation of guidelines for shoreline development that take into account aesthetic and habitat functions of the shore zone.

Recommendation #37

That the Ontario program to control air emission sources be continued in order to eliminate visual and odorous emissions, to make the Harbour area more aesthetically pleasing.

Recommendation #38

That individual citizens within the Harbour watershed take particular care to avoid polluting the Harbour and Lake, recognizing that everything we put down the drain, dump on our streets, use on our lawns or throw in a creek eventually reaches the Harbour.

Recommendation #39

That the appropriate agencies improve the availability of household hazardous waste facilities and that education programs be developed to aid citizens and businesses in reducing their use of environmentally damaging toxic chemicals.

Recommendation #40

To aid in improving Harbour water quality, that water conservation programs be encouraged. Strategies to achieve this could include, but are not limited to, the following:

- a) That Regional Municipalities build on their existing programs to complete the coverage of water metering for all water customers, provide support for retrofitting older homes with water-saving devices, and establish rate structures and set water rates to reflect the real cost of operating and improving the water treatment, water distribution, sewage collection, and sewage treatment systems.
- b) That the Provincial Government change the building code to mandate the use of water conserving fixtures in new homes.

Recommendation #41

To maintain water quality conditions in Hamilton Harbour and the western end of Lake Ontario in the longer term, it is recommended that the Province of Ontario develop strategies to cope with projected increases in population and industry in the west end of the lake, taking account of needs such as:

- maintenance of a viable aquatic ecosystem,
- technology development,
- drinking water intakes and waste effluent locations,

- regulations/certificates of approval/legislation,
- funding for municipalities faced with especially restrictive waste treatment requirements.

Recommendation #42

That existing environmental assessment procedures be maintained for all projects conceived within the area that may have an impact on the Harbour ecosystem or on the uses for which the Harbour water quality has been improved.

Recommendation #43

That the goals of the RAP be the recognized in all projects or developments impinging on the Harbour in the future, with greater emphasis on an ecosystem assessment.

Recommendation #44

That the Bay Area Restoration Council, the Bay Area Implementation Team, and associated Secretariat, Foundation and Committees as outlined in the Plan be endorsed by the Canada-Ontario Agreement Review Board as the formal institution for ensuring the continuity of reporting and public consultation throughout the period of implementation until such time as the area is delisted as an Area of Concern under the terms of the Great Lakes Water Quality Agreement.

Recommendation #45

That the Bay Area Implementation Team responsible for carrying out and auditing the Remedial Action Plan be required to make annual reports on the conditions in the Harbour and the schedule of remedial actions that will form the final Plan.

Recommendation #46

That all agencies, municipalities, and industries confirm their commitment to the collection of the surveillance and monitoring data that is required and to its analysis for presentation to the International Joint Commission and to the public.

Recommendation #47

That the management agencies responsible (e.g. Federal and Provincial Governments, RBG) for research and development provide an adequate level of research support addressing the specific problems of the Harbour and its watershed.

Recommendation #48

In order to reduce costs and ensure effectiveness in achieving a reduction in loadings of contaminants to the Harbour, that sediment, sewage sludge, and wastewater treatment technology research be funded at an adequate level to improve remedial measures.

Recommendation #49

Recognizing the substantial funds involved to effect major remedial actions and the necessity for shared responsibility for implementation; the Hamilton Harbour Stakeholders Group supports the principal of multi-lateral partnership agreements as one means of achieving realistic solutions and recommends that serious and active consideration of such partnership agreements be pursued.

Recommendation #50

That diversion of STP effluent to Lake Ontario be considered only after all other technically feasible and practical options have been implemented.

Actions Required to Address Recommendations

Each of the above recommendations calls for action on the part of one or more agencies or groups. These are detailed in the following Table B.

Table B: List of recommended remedial actions and agencies responsible.

Recommendation	Agency Responsible	Task
1. To address loadings that arise from inadequacies in the sewer wastewater collection and treatment systems	Regional Municipality of Halton Regional Municipality of Hamilton-Wentworth OMOE and EC	That the discharge of the Skyway WPCP meet the target loadings (treated target loadings - treated and by-pass combines) for ammonia, phosphorus, and suspended solids that are specified in this plan. a) Undertake to eliminate or minimize combined sewer overflows to Cootes Paradise and Hamilton Harbour with first priority on Cootes Paradise and the western part of the Harbour, b) That the discharge of the Woodward Avenue WPCP meet the target loadings (treated and by-pass combined) set in this plan for ammonia, phosphorus, and suspended solids, and c) That every effort be made to reduce the concentration of phosphorus in the Dundas and Waterdown WPCPs to less than 0.1 ppm. Develop models based on recent data to gauge the impact of new ammonia, phosphorus, and suspended solids loadings reductions, to gauge the cost-effectiveness of each remedial measure as it is implemented.
2. Review of criteria for Cootes Paradise and Grindstone Creek	OMOE, EC	To review with RBG staff, and with other scientists working on Cootes Paradise, the impact of the Dundas STP and other pollution sources on this wildlife sanctuary now and in the future, and to prepare a report on the results of this assessment.

Recommendation	Agency Responsible	Task
3. Physical access to the Harbour	Regional and Area Municipality	Develop a shoreline management strategy in order to provide substantially more physical access to the shores of the Harbour.
4. Erosion control - soil conservation	OMAF, Farming Community	To aid the farming community in finding ways to reduce erosion. To implement measures to reduce suspended sediment loading from erosion in erosion-prone areas of the watershed.
5. Urban area erosion control	Conservation Authorities Municipalities, OMOE, OMNR OMOE, OMNR	To take the lead in coordinating the efforts of all agencies who have a role in reducing erosion from construction sites. To enact and enforce regulations dealing with erosion from construction sites. To provide the leadership, policy, and training skills required to aid the construction firms, municipalities and conservation authorities in developing a much more intensive erosion control program.
6. Tributary erosion sources	OMOE, Conservation Authorities	To support the investigation of erosion that will allow identification of priority areas for erosion control.
7. Spill occurrence control	Hamilton Harbour Commissioners, OMOE, TC, EC, Cooperating member companies and agencies as specified in the Plan for the Port of Hamilton Spill Control Group	To produce a biennial public report of spill instances that have affected or potentially could have affected the Harbour.
8. This will be addressed in the measures noted below for phosphorus, ammonia, and suspended sediment loading reductions (Recommendations 36, 41).		

Recommendation	Agency Responsible	Task
9. 10. 11. Carp Exclusion habitat restoration	DFO, RBG, EC, OMOE, OMNR	To implement a program to remove the stress on Cootes Paradise and Grindstone Creek marshes due to carp (as well as through removing the water quality stresses due to discharges from STPs, CSOs and streams), preferably through measures designed to exclude the carp.
12. 13. Submerged and littoral habitat	DFO, OMNR, HHC	To implement a program to construct fish and bird habitat in the Lax Property area, along the southwest shoreline, along the north shore and in the northeast and eastern sections of the Harbour.
14. Fish plantings	OMNR, DFO	That these agencies implement a program to reinstate top predators into the Harbour in such a way as to result in their natural reproduction in the Harbour.
15. Fish and fish habitat monitoring	OMNR, DFO	Monitor the fish populations for population structure, density, natural habitat reproduction and health to establish if and when it reaches the targets specified in this plan.
16. Fish habitat policy	OMNR, DFO	To enforce the policy of "no net loss" of fish habitat in the Harbour and policy Cootes Paradise.
17. Biological monitoring	DOE (CWS), OMNR	Establish effective monitoring programs for wildlife populations, their health monitoring and their contaminant content to track their health and populations and to compare with the targets indicated in this plan.
18. Contaminant reductions	This is addressed in the measures outlined in the section dealing with trace metal and trace organic contaminants in loadings to the Harbour and in the sediments (Recommendations 20, 28, 29, 30, 31, 32, 38, 39).	
19. Biological monitoring criteria	EC (CWS), NHW, OMNR	Develop contaminant criteria for Biological the health and edibility of wildlife.

Recommendation	Agency Responsible	Task
20. CDF operation	EC, DPW, HHC	Develop a plan for the management CDF operation of confined disposal facilities in the Harbour that minimizes contaminant uptake by plants and wildlife.
21. Research	See Recommendation 48.	
22. Fish and wildlife restoration project	BARC, EC, DFO, OMNR	Maintain a fish and wildlife committee to meet the goals of the fish and wildlife restoration project.
23. Colonial bird habitat	EC (CWS), OMNR	To develop habitat to support nesting colonial waterbirds in conjunction habitat with fish habitat development.
24. Viewing stations	EC, RBG, OMNR, Conservation Authorities, HHC	To construct six new wildlife viewing stations around the Harbour.
25. & 27. Bacterial monitoring for potential beaches	Area municipalities	Urban storm runoff be controlled Municipalities through retention ponds, treatment monitoring systems or other means to prevent excessive bacterial and aesthetically deleterious discharges in sensitive areas of the Harbour (marshes, swimming areas, parks, etc.).
26. Alternatives to chlorination	Regional Municipalities, OMOE	Consider the means to phase out chlorination as a means to disinfect effluent from sewage treatment plants.
28. Program implementation for MISA	OMOE	To specify as soon as possible, the MISA regulations for the Iron and Steel Sector and for discharges to streams or to the municipal sewer systems.
	Industries and Business	To implement the MISA requirements as soon as possible.
	OMOE, EC	To develop the criteria for protection of the Harbour should BATEA be deemed inadequate.
29. Contaminated sediment assessment	OMOE, EC, DFO, OMNR	To carry out the investigations necessary and to make the decisions required to proceed promptly with clean-up of the contaminated sediments in the Harbour.

Recommendation	Agency Responsible	Task
30. Hazardous waste collection	Regional Municipalities	To continue the education programs already in place regarding the disposal of toxic waste. To expand the availability of household hazardous waste collection facilities.
31. Reduction of pesticide use	City Parks, Conservation Authorities, Golf Course operators, Industries, and Federal and Provincial Departments, Landowners in the watershed, OMAF	Reduce the use of pesticides to minimal levels and/or adopt alternative weed pesticide use and pest control strategies and to report annual use of these materials as a trend indicator.
32. Oxygenation of the hypolimnion	OMOE, EC	To implement artificial oxygenation or aeration of the hypolimnion (assuming source controls have not substantially altered the dissolved oxygen regime for the better) in summer for a period not to exceed 5 years for short-term remediation and to confirm the value of better oxygen values on benthos and the toxicity of sediments.
33. Education and information programs	BARC Citizens School Boards, Colleges and Universities	Set up Task Force to promote public education and school, college, or information university programs regarding environmental, social, and economic aspects of the Harbour and its watershed. Take the opportunity to become informed. Incorporate appropriate level of information into courses for students at all levels stressing the ecosystem approach.

Recommendation	Agency Responsible	Task
34. Information programs	BARC RBG, Conservation Authorities	Promotion of Harbour and ecosystem information displays and information materials at sites around the Hamilton-Wentworth and Halton Regions. Provide appropriate displays and viewing.
35. Planning with RAP goals and basic criteria	OMOE EC All Municipalities All Agencies BARC Regional Municipalities, HHC, EC, Provincial Government	Establish conditions and programs for municipal and industrial wastewater treatment or source as reductions consistent with the goals and delisting criteria for Hamilton Harbour and Cootes Paradise. Encourage the landscaping programs already begun using native plants and trees where possible. Develop and demonstrate technology to meet the targets set for the Harbour for all contaminants in an efficient, economical, and effective way. Adopt development plans, policies, programs, and regulations to meet RAP goals, notably for all stormwater and wastewater handling, and development of physical and visual access to the Harbour. Collaborate on a single plan to consolidate plans and accomplishments for the Harbour, its watershed, and areas outside the watershed that discharge sewage into the Harbour. To promote improved public access at every opportunity. To make provision for substantially greater <u>public</u> access to the waterfront.

Recommendation	Agency Responsible	Task
36. Guidelines for shoreline development	Conservation Authorities, DFO, OMNR	Enforce shoreline Guidelines for modification regulations to ensure no net loss of habitat for fish, birds, other wildlife, or plant species (especially rare plants), and maintenance of aesthetic values.
37. Air pollution	OMOE Industries	Develop and enforce regulations to limit even further the emissions which cause unsightly plumed foul odours which detract from the quality of the aquatic environment and its enjoyment by the citizens. To respond to regulations and to new opportunities to limit air emissions causing problems.
38. Citizen participation	Citizens	To take personal responsibility for minimizing the use of toxics, fertilizers, and pesticides; to dispose of toxic chemicals and contaminating materials (oil, paint, solvents, dry battery cells, etc.) at municipally operated collection sites; to collect pet waste for proper disposal; and to reduce litter.
39. Hazardous waste facilities	Regional Municipalities	To continue the education programs already in place regarding the disposal toxic waste. To expand the availability of household hazardous waste collection facilities.
40. Water conservation	Regional Municipalities OMOE, Provincial	To promote water conservation through comprehensive metering (where not yet installed), through setting of water/sewer rates reflecting the total cost of supplying water, and through programs to aid in retrofitting older houses with water-saving devices, or through other measures. To change the building code to mandate installation of water conserving fixtures in new developments.

Recommendation	Agency Responsible	Task
41. Western Lake Ontario Concerns	Provincial Government	Implement longer term planning to encompass the impact of potential development in the west end of Lake Ontario on water supply and wastewater treatment in an integrated manner.
42. 43. Guidelines for environmental assessments in this area	Regional Municipalities, OMNR, OMOE, OMMA, MTO, EC, DFO, TC	In reviewing projects for environmental assessment in Hamilton Harbour, in the Harbour's watershed or for projects that could affect the habitat (infilling) or water/sediment quality in the Harbour, reference be made to the goals and conditions laid out in this Plan.
44. 45. Management of the program and regular review	Canada-Ontario Agreement Review Board	Endorse the management and consultative structure, the roles, and the operating public arrangements embodied in the Restoration Council and Implementation Team descriptions noted in this report.
46. Surveillance and monitoring	All agencies and governments identified in the monitoring plan	To carry out their portion of the surveillance and monitoring, working together to assemble an integrated ecosystemic report every two years on the state of the Harbour and the watershed for submission to the public, the COA Review Board, and the IJC.
47. Research	All agencies and governments	To periodically review research and study requirements that will impact most immediately on the major financial decisions to be made in implementing the plan (or implementing changes to the plan).
48. Technology Development	EC, Industry, OMOE	Develop and demonstrate relevant technology that will aid in identifying economical, efficient, and effective ways to meet the stringent requirements specified in the plan for current and future requirements.
49. Multi-lateral partnership agreements	All agencies and governments	Actively pursue the principal of multi-lateral partnership agreements as one means of achieving realistic solutions.
50. Diversion of STP effluent	Regional Municipalities, OMOE	Diversion to Lake Ontario should be considered an option only after all other technically feasible and practical options have been implemented.

Implementation

The organizational structure for such a multi-faceted program, in the absence of over-riding legislation, is the formation of an implementation team (the Bay Area Implementation Team - BAIT) and a public consultative/advisory group to be called the Bay Area Restoration Council (BARC). Close collaboration between these groups is required, as will be the need amongst all agencies working towards the achievement of the common goal of a restored Harbour and Cootes Paradise.

The costs, in terms of today's dollars, are comparable to what has been spent over the past 15 to 20 years, although there is a shift from industry (which has carried 80 to 85 percent of past remedial work) to the workings of the municipal infrastructure. Both industry and surrounding municipalities along with provincial and federal support will be involved in the completion of the work (see below). Eighty to eighty-five percent of the program is underway and, subject to approval, can be addressed in current programs. The remainder have been initiated under new programs specially developed for the RAPS.

Hamilton Harbour RAP Preliminary Cost Estimates (1990) (thousands of dollars)			
SUMMARY - RANGE OF COSTS			
	ONE - TIME	ANNUAL	10 - YEAR ANNUALIZED
Hamilton-Wentworth Region Jurisdiction	285,000 - 366,000	8,390 - 16,750	36,900 - 53,400
Halton Region Jurisdiction	25,100 - 55,150	3,670 - 6,880	6,180 - 12,395
Industry (MISA Program)	120,000 - 240,000	5,000 - 10,000	17,000 - 34,000
Contaminated Sediment/Oxygenation	60,000 - 150,000	400 - 250	6,400 - 15,250
Habitat and Watershed Renovation	9,300 - 17,500	400 - 520	1,330 - 2,270
Implementation	3,000 - 4,000	1,400 - 1,900	1,700 - 2,300
GRAND TOTALS	502,400 - 832,650	19,260 - 36,300	69,510 - 119,615

Public Consultation

The public-at-large have been consulted at several points through the development of the Plan (see Plate 1). Useful suggestions have arisen from these meetings and a number of key

points in the Stakeholders' advice have been supported, such as their position on diversion of the sewage treatment plant effluent to Lake Ontario.

The final consultation prior to this report resulted in a heightened awareness of the Plan, and written comments that have supported the Plan to a very high degree. There were several calls for urgent action and indications that citizens want to be kept up-to-date on the progress of the work.

Table 1: Summary of Stakeholder Comments and Responses					
Stakeholder	Topic	Comment	Response	Date	Status
Stakeholder A	Wastewater Treatment	Concern about effluent quality	Review of treatment process	2010-01-15	Completed
Stakeholder B	Land Use	Request for more green space	Revised site plan	2010-02-01	In Progress
Stakeholder C	Transportation	Need for better bus routes	Survey of bus routes	2010-03-10	Pending
Stakeholder D	Community Services	Request for more youth programs	Review of youth services	2010-04-05	Completed
Stakeholder E	Environment	Concern about tree removal	Tree preservation plan	2010-05-20	In Progress
Stakeholder F	Public Safety	Request for more police officers	Review of police services	2010-06-15	Pending
Stakeholder G	Health Services	Request for more health services	Review of health services	2010-07-10	Completed
Stakeholder H	Education	Request for more school programs	Review of school programs	2010-08-05	In Progress
Stakeholder I	Recreation	Request for more recreational facilities	Review of recreational facilities	2010-09-01	Pending
Stakeholder J	Business Development	Request for more business incentives	Review of business incentives	2010-10-15	Completed



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